Remarks

This paper is submitted in order to advance prosecution of the co-filed Continued Prosecution Application. In addition, this paper is submitted responsive to the Board's Decision affirming the Examiner's rejection of the prior filed claims, and pursuant to the Board's indication that there are differences between the previously applied art and applicants' disclosed invention, however, that the language of the prior pending claims did not adequately express those differences. Without acquiescing to this conclusion, applicants submit herewith amendments to independent claims 1, 18 & 29 in order to advance prosecution of this application. Support for these claim amendments can be found throughout the application as filed. For example, reference page 4, lines 28-32, page 17, lines 17-23, page 18, lines 26-33, page 23, lines 16-30, as well as FIGs. 6 & 7. No new matter is added to the application by any amendment presented.

The present invention recites a method, system and computer program product (claims 1, 18 & 29) that allow for the encoding of a sequence of video data. The encode approach includes storing within a quantizer multiple sets of quantization matrix tables at the same time (e.g., 263, 264 of FIG. 6). The sets of quantization matrix tables are separate and independent (e.g., 270, 280 of FIG. 7), and each set comprises at least one intra-matrix table and at least one non intra-matrix table (see FIG. 7). As used herein, a "table" comprises multiple coefficients or entries, e.g., an 8×8 array of coefficients. A "set" of tables comprises two or more tables. Each set is recited to comprise at least one intra-matrix table and at least one non intra-matrix table. A quantizer (e.g., 250 of FIG. 6) quantizes the sequence of video data in a single pass using one set of the multiple sets of quantization matrix tables. Means (e.g., 261 of FIG. 6) are also provided for dynamically switching the quantizer from using the one set of quantization matrix tables to using another set of quantization matrix tables. See page 14, line 28 – page 17, line 7 of the specification. As recited in the claims presented, this dynamically switching occurs in real-time and occurs without requiring stopping of the encode process. Further, while one set of quantization matrix tables within the quantizer is being employed, another set of quantization matrix tables can be updated or modified within the quantizer.

With respect to the prior substantive rejections, claim 29 was rejected under 35 U.S.C. §102(e) as being anticipated by Wheeler et al. (U.S. Pat. No. 5,825,680); claims 1-4, 10-12, 18-20 and 23-25 were rejected under 35 U.S.C. §103(a) as being unpatentable over Katayama (U.S. Pat. No. 5,422,736) in view of Wheeler et al.; claims 5-6, 9 and 21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Katayama and Wheeler as applied to claims 1 and 18, respectively, and further in view of Sasaki et al. (U.S. Pat. No. 5,530,478); claims 7-8 & 22 were rejected under 35 U.S.C. §103(a) as being unpatentable over Katayama and Wheeler et al. as applied to claims 1 and 18, respectively, and further in view of Rick et al. (U.S. Pat. No. 5,987,179); and claims 13-17 & 26-28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Katayama and Wheeler et al. as applied to claims 1 and 18, respectively, and further in view of Hosono (U.S. Pat. No. 5,796,438). Each of these rejections is respectfully traversed to any extent deemed applicable to the claims presented herewith.

With respect to claim 29, Wheeler et al. describe a method and apparatus for performing fast division in accordance with certain bandwidth requirements particular to an implementation described therein. A pseudo pipelined approach for performing division using the SRT non-restoring division algorithm is described which uses a minor clock and a major clock cycle time. The number of stages in the division pipeline is a function of the parameters bandwidth requirements of the system. More particular to the present invention, the Office Action cites column 13, lines 18-32 of Wheeler et al. as relevant to the presently claimed invention. These lines describe a quantization unit 644 shown in FIG. 28. In the preferred embodiment, there are two quantization tables; i.e., one table is used when operating on intra-coded macroblocks, and the other table is used on non-intra-coded macroblocks. These quantization tables are stored in queue table RAMS 690. At column 13, lines 24-32, the patent states:

> ...In the preferred embodiment there are two quantization tables; one table is used when operating on intra-coded macroblocks, the other table is used on non-intra-coded macroblocks.
>
> As shown in FIG. 7, the quantization tables are stored in Q table RAMS 690. The CPU is responsible for loading all Q table entries. During encode and decode, the CPU loads the tables as required. Thus, the CPU is responsible for updating Q tables on video stream context switches.

Applicants respectfully submit that a careful reading of Wheeler et al. indicates that the patent is describing the MPEG standard which requires the use of an intra-coded matrix table and a non-intra-coded matrix table, and therefore requires a switching from the intra table to the non-intra table during the encoding process. The above-noted lines of column 13 of the patent would be read by one skilled in the art as referring to this switching between intra and non-intra tables at a context switch, e.g., a scene change.

Applicants invention recited in claim 29 includes computer readable program code means for storing multiple sets of quantization matrix tables within a quantizer at the same time, wherein each set of quantization matrix tables comprises a separate, independent set of tables, and each set comprises at least one intra matrix table and at least one non-intra matrix table. The present invention assumes a normal "real time" switching of intra and non-intra tables such as described in Wheeler et al., but further adds the ability to dynamically switch in real-time from one complete set of intra and non-intra tables to another complete set of intra and non-intra tables in a single pass without requiring stopping of the encoding process. Further, applicants' recited invention allows the updating of one set of quantization matrix tables within the quantizer while another set of quantization matrix tables is in use. Again, each set comprising at least one intra matrix table and at least one non-intra matrix table.

In applicants' claimed invention, an enhancement is submitted whereby a user is allowed multiple sets of quantization matrix tables within the quantizer, with each set comprising at least one intra matrix table and at least one non-intra matrix table. By holding multiple sets of quantization matrix tables within the quantizer at the same time, and maintaining these tables separate and independent, applicants are able to allow for dynamic switching in real-time of complete sets of quantization matrix tables without requiring stopping of an encode process. Further, applicants allow for the dynamic updating of a set of quantization matrix tables within the quantizer while another set of quantization matrix tables is in use by the quantizer.

A careful reading of Wheeler et al. fails to uncover any discussion of switching between complete sets of tables. The patent expressly teaches in a preferred embodiment there are two

quantization tables. One table is for operating on intra-coded macroblocks, and the other table is used for non-intra-coded macroblocks. In contrast, applicants recite switching between full sets of tables, wherein one set comprises at least one intra matrix table and at least one non-intra matrix table. Thus, in applicants' approach, there are a minimum of four quantization tables within the quantizer at the same time between which the dynamic switching occurs.

For all the above reasons, applicants respectfully submit that the independent claims presented herewith, and in particular, claim 29, patentably distinguish over the teachings of Wheeler et al.

Prior independent claims 1 & 18 were rejected based upon the combination of Katayama in view of Wheeler et al. As noted above, this rejection is respectfully traversed and reconsideration thereof is requested.

Katayama describes a technique for encoding image data which maintains the quality of the image. The patent notes that it has been conventional practice that coefficients obtained from discrete cosine transformation are quantized using a single quantization table. If, however, an identical quantization is performed for images that are considerably dissimilar in their statistical characteristic, deterioration of image occurs especially at character portions where high frequency dominates.

In FIG. 8 of Katayama, three quantization tables are shown. One table holds chrominance coefficients, and two tables hold luminance coefficients, one for photographs 59, and the other for characters (i.e., letters) 58 within the photographs. As described at column 9, lines 24-44 of the patent, a character/photograph judging method is taught in which a block is considered a character region when an edge exists within that block, while it is considered a photograph region if no edge exists. (As used in the application, a block refers to a macroblock of data within a picture). Any system capable of character/photograph judgment may be used to make the determination of an edge. A switching signal is provided to a selector (56 or 57 in FIG.

8) which selects either a character-Y quantization table or a photograph-Y quantization table, or the chrominance table.

Although not expressly stated, it is clear from a reading of Katayama that the patent is addressing encoding of still images. First, a careful reading of Katayama fails to uncover any discussion of motion or motion estimation during the encode process. In addition, throughout the patent Katayama makes reference to facsimilies, still photos and a character/photograph judgment scheme. For example, column 1, lines 9-12 indicate that the field of the invention relates to image processing applicable to a color facsimile, color image file and the like. Column 4, lines 29-36 indicate that an image output device may be used such as a laser beam printer, an ink-jet printer or a display device. Obviously, motion video cannot be printed using a laser beam printer or an ink-jet printer, but a photo can be displayed on a display device. Column 5, lines 37-49 refer to quantization tables for Y data to be used for photographs, and for Y data to be used for characters. The patent consistently discusses switching between the photograph-Y-data quantization table and the character-Y-data quantization table in accordance with a character/photograph judgment. The character/photograph judgment is also discussed at columns 8 & 9 of the patent. Based upon the above, applicants respectfully submit that Katayama is describing encoding of still photographs which may contain character information within the photograph.

Encoding of still photographs is significantly different than encoding motion video. In a still photograph encode process, all pixel information is used, i.e., intra data on the photograph is used in order to detect edges of the characters. Thus, applicants respectfully submit that one skilled in the art would understand Katayama as using intra-coded tables for the chrominance and luminance tables referred to in the patent. In fact, non-intra-coded tables could not exist in a still photograph encode process such as described by Katayama. As understood by one skilled in the art, non-intra matrix tables arise and are employed during motion estimation, i.e., for bi-directionally encoded frames of a video. Because Katayama itself inherently teaches away from the proposed combination, applicants respectfully request reconsideration and withdrawal of any

obviousness rejection to independent claims 1 & 18 based upon the combination of the teachings of Katayama and Wheeler et al.

Notwithstanding the above, applicants respectfully submit that the combination of the teachings of Wheeler et al. with Katayama would still not produce the invention as claimed herein for the reasons noted above in connection with Wheeler et al. Thus, applicants respectfully submit that there is no suggestion in the prior art which would have led one skilled in the art to their claimed invention.

The dependent claims are believed allowable for the same reasons as their respective independent claims, as well as for their own additional characterizations.

Based upon the above, applicants respectfully submit that the application is in condition for allowance and request such action.

Respectfully submitted,

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